

IN THE CLAIMS:

Please amend the claims as follows:

1. (Currently amended) An active matrix liquid crystal display device, comprising:
 - a first substrate and a second substrate, at least one of said first substrate and said second substrate being transparent;
 - a plurality of scanning lines formed on said first substrate;
 - a plurality of signal lines formed on said first substrate crossing said scanning lines in a matrix manner;
 - a plurality of thin film transistors, each said thin film transistor respectively formed at an intersection of said scanning lines and said signal lines, each said thin film transistor comprising:
 - a gate electrode formed on said first substrate;
 - a gate insulation layer formed on said gate electrode;
 - a semiconductor layer formed on said gate insulation layer;
 - a drain electrode formed on a first portion of said semiconductor layer and a first portion of said gate insulation layer; and
 - a source electrode formed on a second portion of said semiconductor layer and a second portion of said gate insulation layer;
 - a passivation film formed on said thin film transistors;
 - at least one color filter formed on said first substrate, a color film forming said at least one color filter additionally covering said passivation film;
 - a plurality of pixel electrodes, each respectively connected to one of said thin film transistors through a contact hole and each respectively formed on one of said at least one color filter;

a counter electrode formed on said second substrate; and

a liquid crystal layer between said first substrate and said second substrate, said liquid crystal layer being driven by electric fields between said pixel electrodes and said counter electrode to thereby make a display,

wherein said color filter is formed directly on said first substrate in substantially all of a light transmission region within a pixel area surrounded by said scanning lines and said signal lines, a thickness of said color film forming said color filter being a preselected first thickness that provides a sufficient chromaticity for said color filter, and

said passivation film provides an additional layer over said thin film transistors that reduces a thickness of material of said color filter near said contact hole to a second predetermined thickness chosen to permit a photo-crosslinkage to occur in an entire thickness of said second thickness of said color filter material during an exposure processing for said contact hole to allow a small dimension for said contact hole formed through said color filter material, wherein a width dimension of said contact hole is no more than approximately 5 μm .

2. (Currently amended) An active matrix liquid crystal display device, comprising:

a first substrate and a second substrate, at least one of said first substrate and said second substrate being transparent;

a plurality of scanning lines formed on said first substrate;

a plurality of signal lines formed on said first substrate crossing said plurality of scanning lines in a matrix manner;

a plurality of thin film transistors, each said thin film transistor formed at each of intersections of said scanning lines and said signal lines, each said thin film transistor comprising:

a gate electrode formed on said first substrate;

a gate insulation layer formed on said gate electrode;

a semiconductor layer formed on said gate insulation layer;

a drain electrode formed on a first portion of said semiconductor layer and a first portion of said gate insulation layer; and

a source electrode formed on a second portion said semiconductor layer and a second portion of said gate insulation layer;

a passivation film formed on said thin film transistors;

at least one color filter formed on said first substrate;

an overcoat layer formed on each of said at least one color filter;

a plurality of pixel electrodes, each respectively connected to one of said thin film transistors through a contact hole;

a counter electrode formed on said second substrate; and

a liquid crystal layer between said first substrate and said second substrate, said liquid crystal layer being driven by an electric field between said pixel electrodes and said counter electrode to thereby make a display,

wherein said at least one color filter is formed directly on said first substrate in most of a light transmission region within a pixel area surrounded by said scanning lines and said signal lines to a first predetermined thickness that provides a sufficient chromaticity for said color filter,

Serial No. 09/585,472
Docket No. 157330/99 (NEC.173)

said passivation film providing an additional layer that reduces a thickness of material of said color filter near said contact hole such that the reduced thickness of said material allows a dry etching processing of said contact hole without damage to said overcoat layer, wherein a width dimension of said contact hole is no more than approximately 5 μm .

3. (Canceled)

4. (Previously presented) An active matrix liquid crystal display device according to claim 1, wherein said color filter comprises an organic film, a difference in level generated on a surface of the organic film being not more than 0.3 μm .

5. (Previously presented) An active matrix liquid crystal display device according to claim 1, wherein said color filter comprises a photosensitive acrylic resin having a pigment dispersion property.

6. (Currently amended) A method of manufacturing an active matrix liquid display device, the method comprising:

forming a plurality of scanning lines on a first substrate;

forming a plurality of signal lines crossing the plurality of scanning lines in a matrix manner;

forming a plurality of thin film transistors, each respectively located at intersections of the plurality of scanning lines and the plurality of signal lines, each said thin film transistor comprising:

- a gate electrode formed on said first substrate;

- a gate insulation layer formed on said gate electrode;

- a semiconductor layer formed on said gate insulation layer;

- a drain electrode formed on a first portion of said semiconductor layer and a first portion of said gate insulation layer; and

- a source electrode formed on a second portion of said semiconductor layer and a second portion of said gate insulation layer;

- forming pixel electrodes respectively connected to each of said thin film transistors;

- forming a counter electrode on a second substrate;

- injecting a liquid crystal between said first substrate and said second substrate and sealing the liquid crystal,

wherein said method further comprises:

- forming a passivation film to provide an extra layer on top of said thin film transistors;

- removing said gate insulating layer and said passivation film of each of said thin film transistors in a region surrounded by said signal lines and said scanning lines to expose a surface of said first substrate adjacent to each said thin film transistor;

- forming a color filter respectively on said exposed first substrate surface adjacent to each said thin film transistor, a thickness of a color film forming said color filter being a

Serial No. 09/585,472
Docket No. 157330/99 (NEC.173)

preselected first thickness that provides a sufficient chromaticity for said color filter, said first thickness additionally causing said color film to cover said passivation film on said adjacent thin film transistor to a second thickness, said second thickness permitting a photo-crosslinking of said entire thickness during an exposure process;

forming a contact hole in said color filter and said passivation film on each of said thin film transistors, wherein a width dimension of said contact hole is no more than approximately 5 μm ; and

forming said plurality of pixel electrodes, each comprising a transparent conductive film electrically connected through said contact hole.

7. (Currently amended) A method of manufacturing an active matrix liquid crystal display, the method comprising:

forming a plurality of scanning lines on a first substrate;

forming a plurality of signal lines crossing the plurality of scanning lines in a matrix manner;

forming a plurality of thin film transistors, each respectively located at intersections of the plurality of scanning lines and the plurality of signal lines, each said thin film transistor comprising:

a gate electrode formed on said first substrate;

a gate insulation layer formed on said gate electrode;

a semiconductor layer formed on said gate insulation layer;

a drain electrode formed on a first portion of said semiconductor layer and a first portion of said gate insulation layer; and

a source electrode formed on a second portion of said semiconductor layer and a second portion of said gate insulation layer;

forming a pixel electrode connected to each said thin film transistor;

forming a counter electrode on a second substrate;

injecting a liquid crystal between said first substrate and said second substrate and sealing the liquid crystal;

wherein said method further comprises:

forming a passivation film to provide an extra layer on top of said thin film transistors;

removing said gate insulting layer and said passivation film of each of said thin film transistors in a region surrounded by said signal lines and said scanning lines to expose a surface of said first substrate adjacent to each said thin film transistor;

forming a color filter respectively on said exposed first substrate surface adjacent to each said thin film transistor, a thickness of a color film forming said color filter being a preselected first thickness that provides a sufficient chromaticity for said color filter, said first thickness additionally causing said color film to cover said passivation film on said adjacent thin film transistor to a second thickness;

forming an overcoat layer on said color filter;

patterning said overcoat layer;

forming a contact hole by patterning said color filter while using said overcoat layer as a mask, said second thickness permitting an etching of said contact hole through said color filter material without damaging said overcoat layer, wherein a width dimension of said contact hole is no more than approximately 5 μm ; and

forming said pixel electrodes, each said pixel electrode comprising a transparent conductive film electrically connected through said contact hole.

8. (Previously presented) An active matrix liquid crystal display device according to claim 2, wherein the color filter around said contact hole is thinner than the color filter in said light transmission region.

9. (Previously presented) An active matrix liquid crystal display device according to claim 2, wherein said color filter comprises an organic film, a difference in level generated on a surface of the organic film being not more than 0.3 μm .

10. (Previously presented) An active matrix liquid crystal display device according to claim 2, wherein said color filter comprises a photosensitive acrylic resin having a pigment dispersion property.

11. (Currently amended) An active matrix liquid crystal display device, comprising:

a plurality of pixels, each of said pixels comprising:

a transistor;

a passivation film formed to cover said transistor with an additional layer;

a color filter formed to fill a pixel opening adjacent to said transistor, said color filter having a preselected first thickness in said pixel opening to provide a sufficient chromaticity for said color filter, said first thickness additionally causing a color film forming said color filter to cover said passivation film on said adjacent thin film transistor to a second thickness; and

a pixel electrode formed to cover said color filter that fills said pixel opening and connected to an electrode of said transistor through a contact hole passing through said passivation film and through said color film covering said passivation film, wherein said second thickness is preselected so that a characteristic of said color film allows said contact hole to be formed in a fine patterning,

wherein a width dimension of said contact hole is no more than approximately 5 μm .

12. (Previously presented) The device as claimed in claim 11, wherein said characteristic of said color film that allows said fine patterning of said contact hole comprises an amount of cross-linking of said color film that occurs within said second thickness.

13-14. (Canceled)

15. (Previously presented) The device as claimed in claim 12, wherein each of said pixels further comprises:

an overcoat layer inserted between said color filter and said pixel electrode to serve as a mask during formation of said contact hole,

wherein said characteristic of said color film that allows said fine patterning of said contact hole comprises an etching rate of said color film such that said second thickness of color film material is etched through to form said contact hole without damage to said overcoat layer by said etching process.

16. (Previously presented) The device as claimed in claim 12, wherein each of said pixels further comprises a signal line connected to said transistor, said color filter provided for one of said pixels being extended to and terminated on the signal line connected to an adjacent one of said pixels with an intervention of a part of said passivation film.

17. (Currently amended) A method of manufacturing an active matrix liquid crystal display device, the method comprising:

forming a plurality of pixels, said forming of said plurality of pixels comprising, for each of said pixels:

providing a transistor;

forming a passivation film to cover said transistor;

forming a first hole in said passivation film to provide a pixel opening;

forming a color filter to fill said pixel opening, said color

filter having a preselected first thickness in said pixel opening to provide a chromaticity for said color filter, said first thickness additionally causing a color film material of said color filter to cover said passivation film covering said transistor with a second thickness;

forming a contact hole through said color film and said passivation covering said transistor to expose an electrode of said transistor, wherein said second thickness allows said contact hole to be formed with a fine pattern due to a characteristic of said color film material, wherein a width dimension of said contact hole is no more than approximately 5 μm ; and

forming a pixel electrode to cover said color filter and connect to the electrode of said transistor through said contact hole.

18. (Previously presented) The method as claimed in claim 17, wherein said characteristic comprises a photo-crosslinking characteristic, said second thickness allowing sufficient photo-crosslinking to occur for said fine patterning of said contact hole forming.

19-20. (Canceled)

21. (Previously presented) The method as claimed in claim 18, further comprising:

for each of said pixels, inserting an overcoat layer between said color filter and said pixel electrode to serve as a mask for said contact hole forming,

wherein said characteristic of said color film that allows said fine patterning of said contact hole comprises an etching rate of said color film such that said second thickness of color

film material is etched through to form said contact hole without damage to said overcoat layer by said etching process.

22. (Previously presented) The method as claimed in claim 18, further comprising, for each of said pixels, providing a signal line connected to said transistor, said color filter provided for one of said pixels being extended to and terminated on the signal line connected to an adjacent one of said pixels with an intervention of a part of said passivation film.

23. (Previously presented) The method of claim 17, wherein said first thickness is approximately 1.2 μm and said second thickness is no more than approximately 0.3 μm .

24. (Previously presented) The active matrix liquid crystal display device of claim 1, wherein said second predetermined thickness being less than approximately 0.4 μm .

25. (Previously presented) The active matrix liquid crystal display device of claim 1, wherein said first predetermined thickness is approximately 1.2 μm .

26. (Previously presented) The active matrix liquid crystal display device of claim 1, further comprising:

an overcoat layer between said at least one color filter and said pixel electrodes.

27. (Canceled)

28. (Currently amended) The active matrix liquid crystal display device of claim 27 1, wherein said source electrode is sandwiched between said gate insulation layer and said passivation film, wherein the passivation film completely covers both the source electrode except a portion for connecting to said pixel electrode and gate insulation layer around said source electrode.

29. (Previously presented) The active matrix liquid crystal display device of claim 28, wherein an opening penetrating said gate insulation layer and said passivation film is located at said light transmission region, wherein a part of said color filter fills said opening of said gate insulation layer and said passivation film and is formed directly on said first substrate, and other part of said color filter is elongated to cover said thin film transistor.

30. (Previously presented) The active matrix liquid crystal display device of claim 28, wherein an edge of said gate insulation layer and an edge of said passivation film at said opening are kept aligned with each other in said light transmission region.

31. (Currently amended) The active matrix liquid crystal display device of claim 27 1, wherein an opening penetrating said gate insulation layer and said passivation film is located at said light transmission region, wherein a part of said color filter fills said opening of said gate insulation layer and said passivation film and is formed directly on said first substrate, and other part of said color filter is elongated to cover said thin film transistor.

Serial No. 09/585,472

Docket No. 157330/99 (NEC.173)

32. (Previously presented) The active matrix liquid crystal display device of claim 31, wherein an edge of said gate insulation layer and an edge of said passivation film at said opening are kept aligned with each other in said light transmission region.